

When a Standard Candle Flickers: Crab Nebula Variations in Hard X-rays

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RXTE played a crucial role in our surprising discovery that the Crab Nebula is variable in hard X-rays. In the first two years of science operations of the Fermi Gamma-ray Burst Monitor (GBM), August 2008-2010, a $\sim 7\%$ (70 mcrab) decline was discovered in the overall Crab Nebula flux in the 15 - 50 keV band, measured with the Earth occultation technique. This decline was independently confirmed in the ~ 15 -50 keV band with four other instruments: the RXTE/PCA, Swift/BAT, INTEGRAL/IBIS, and INTEGRAL/SPI. The pulsed flux measured with RXTE/PCA from 1999-2010 was consistent with the pulsar spin-down, indicating that the observed changes were nebular. From 2001 to 2010, the Crab nebula flux measured with RXTE/PCA was particularly variable, changing by up to $\sim 3.5\%$ per year in the 15-50 keV band. These variations were confirmed with INTEGRAL/SPI starting in 2003 and Swift/BAT starting in 2005. Before 2001 and since 2010, the Crab nebula 15-50 keV flux measured with RXTE/PCA appeared more stable, varying by less than 2% per year. In this talk I will present Crab light curves including RXTE data for the entire 16-year mission in multiple energy bands.